DOCUMENT RESUME

ED 197 462 EA 013 287

| | |
|---|---|
| TITLE | The Future for Teacher Education in Ontario. Simulation Experiments to Examine the Impact of Environmental Factors and Policy Decisions on Ontario Teacher Education Institutions 1978-2002. |
| INSTITUTION | Hansen Group, Mississauga, Ontario. |
| SPONS AGENCY | Commission on Declining School Enrolments in Ontario, Toronto. |
| REPORT NO | CODE-WP-35 |
| PUB DATE | Sep 78 |
| NOTE | 64p.: Some paragraphs may not reproduce clearly due to broken print of original document. For related documents, see EA 013 260-308. |
| AVAILABLE FROM | Publications Centre, Ministry of Government Services, 880 Bay St., 5th Floor, Queen's Park, Toronto, Ontario M7A 1N8 Canada (Record No. ON01444/CODE00313: $.50 microfiche). |
| EDRS PRICE | MF01/PC03 Plus Postage. |
| DESCRIPTORS | *Declining Enrollment: Employment Projections: Enrollment Projections: Expenditure Per Student: Foreign Countries: Higher Education: Inservice Teacher Education: Preservice Teacher Education: *Schools of Education: Simulation: Student Teacher Ratio: *Teacher Education: *Teacher Supply and Demand: Trend Analysis |
| IDENTIFIERS | Ontario |

ABSTRACT

A summary of issues and options in the supply of and demand for teacher education provides the background for this study. The FLEXOR* Teacher Education Analytical Model is used to examine the effects of environmental factors and policy decisions on Ontario's teacher training institutions in the next 20 years. The simulation models utilize such variables as the ratio of students enrolled to graduates hired, the inservice training proportion, the student/faculty ratio, faculty turnover rates, average faculty salary, yearly operating cost changes, inservice/preservice cost ratio, cost per student, and cost per graduate hired. The simulations indicate that 1980-84 represents a low phase of cyclic activity and is, consequently, inappropriate for use in planning for allocation of resources. The data for 1986-87 provide more reasonable target values for planning purposes. The authors recommend that careful study precede any consideration of school closure. The long term simulation model suggests that the percentage of new teachers hired will maintain vitality in the teaching force and provide opportunities for new, young teachers. (Author/WD)

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WORKING PAPER NO. 35

ED197462

# THE FUTURE FOR TEACHER EDUCATION IN ONTARIO

## Simulation Experiments to Examine the Impact of Environmental Factors and Policy Decisions on Ontario Teacher Education Institutions 1978-2002

THE HANSEN GROUP
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SEPTEMBER, 1978

COMMISSION ON DECLINING SCHOOL ENROLMENTS IN ONTARIO (CODE)

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# THE FUTURE FOR TEACHER EDUCATION IN ONTARIO

## Simulation Experiments to Examine the Impact of Environmental Factors and Policy Decisions on Ontario Teacher Education Institutions 1978-2002

The Hansen Group

September, 1978

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*This study reflects the views of the authors and not necessarily those of the Commission or the Ministry of Education.*

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## Introduction

We described the structure and uses of the teacher education analytical model and some inferences from preliminary experiments in our February 22nd Interim Report.

A status report submitted June 26 was devoted to an analysis of White Paper issues and options and to a further description of the types of variables incorporated in the model: the environmental (exogenous), and endogenous (derived from within the model) factors, and policy decisions which influence the particular values assumed by the variables in the various experiments. Possible teacher education allocation patterns in 1986-87 were also examined.

This final report incorporates modified material from the June 26 status report plus additional analyses arising out of examination of projected school enrolment and teacher education faculty attrition patterns to the year 2001.

Documentation of the model is included in a separate report.

# SECTION I

## SUMMARY OF ISSUES AND OPTIONS - SUPPLY AND DEMAND OF PRESERVICE AND INSERVICE TEACHER EDUCATION

## SECTION I SUMMARY OF ISSUES AND OPTIONS•SUPPLY AND DEMAND OF PRESERVICE AND INSERVICE TEACHER EDUCATION

An early discussion paper prepared by the Commissioner contained comments and suggestions on the crucial problems and possible solutions for incorporation into a later "white paper". To provide a background to the simulation experiments described herein, the comments in respect of teacher education are summarized as follows:

### Factors Influencing Demand for Pre-service Teacher Education

Demand for Ontario-educated school teachers may be influenced by policy or inertia-generated declines in the pupil/teacher ratio; by market extension and expansion, eg., service overseas thru CUSO, CIDA and UNESCO,extended services in nursery schools, day care centres, welfare and social work; reform and penal institutions, hospitals, senior citizen centres, native people communities, adult recreational and rehabilitation education; by change in teacher work patterns, eg., job sharing, extension of part-time teaching sabbaticals and leaves of absence, early retirement; by establishment of hiring barriers to teachers educated in other jurisdictions. Also, as alternative program options constrict owing to high demand and tougher entrance requirements (commerce and finance, for example), one of the consequences may be a rise in the demand for admission to Faculties of Education.

### Factors Influencing Supply of Pre-service Educated Teachers

Supply of Ontario-educated teachers may be influenced by policy controls, eg., controls on admissions to teacher education institutions, controls on in-migration of trained teachers, by policies on inter-board transfers. Supply of teachers is also influenced by prospective students responding to market signals and "voting with their feet", ie., not enrolling in teacher-education institutions. Supply can also be controlled by deciding to maintain all existing institutions at minimum levels or by closing down one or more institutions to make the remaining institutions more cost-effective. (Political rationales will have to be considered in such closure decisions). The Minister of Education could exert enormous influence over supply by policy on the issuance of teaching certificates.

### Pre-service Education Program Options

Program and curriculum changes could be made to alleviate problems caused by declining enrolments. Pre-service education curricula could be enlarged so that the graduate is qualified to teach more subjects and therefore able to move from low demand subjects to high demand subjects and from one panel to the other.

It should be noted however, all other things being equal, any enlargement of the pre-service curriculum to include additional options could only be accomplished by either diluting the present program quality or by increasing the length of the program. Practice-teaching could be lengthened and converted to an internship program with nominal pay for the internship period. Joint programs could be developed with other university faculties with the goal being partial integration. More integration could be achieved by moving away from the one-year professional program to an integrated four-year concurrent program. While integration and concurrency would not alleviate the long term faculty surplus problem created by declining enrolment, it could postpone difficult firing decisions and would improve inter-faculty cooperation.

Supply and Demand of In-service Education

Declining school enrolments creates need (and opportunity) for retraining active and inactive teachers for other subjects, other levels, specialist education, education to meet the needs of new market demands, graduate education, up-grading of teachers with less than present minimum requirements in academic preparation. There could be a planned upgrading of teachers' skills in English, Math and basic arts and sciences. Retraining might be given during enforced education leaves or sabbaticals with no penalty to benefit entitlements and with or without loss of salary for the retraining period. Establishment of requirements for term certification would create a recurring demand for professional development to meet re-certification standards. Faculty of the teacher education institutions might become more involved "on-site" at boards and schools for assistance in working with children, retraining, up-grading, curriculum development. As demand for pre-service education declines, the excess capacity could be absorbed by planned in-service education. In-service programs, not at this time bound by rigid vested interests, offer opportunity for interfaculty cooperation in (1) developing complimentary areas of specialization, (2) building new models for in-service programs and (3) rotating the Ministry certificate courses in some systematic way.

In-service Education Program Options

Programs and curricula could be modified to meet in-service education needs, training in professional development programs leading to certificates and diplomas; graduate degrees; retraining programs facilitating transfers and exchanges between panels; non-credit work upgrading of teachers' education levels; expansion of subject fields.

Facilities and Staff Options

Full and partial closure options could be exercised including keeping all facilities at a minimum staffing level; closing parts or all of some institutions while leaving others open to meet minimum regional needs; allocating pre-service functions to some; in-service and graduate education functions to others. The stronger and larger faculties of education could be reserved largely for graduate studies, research and development, in-service education while other smaller institutions could be reserved for meeting pre-service regional needs. It should be noted, however, that faculty specialization at the in-service/graduate level could result in deterioration of standards and feelings of isolation and inferiority among the faculty in these units.

System Organization, Planning and Control

Regions and boards could undertake studies of projected teacher demand by subject area assisted by faculties of education serving the region. Transfer options between boards could be examined in the light of evidence revealed by demand studies. The concept of regional and provincial supply pools might be explored as a desirable development. The critical question of aging of faculty and appropriate balance of experienced and new young teachers could be seriously examined instead of receiving lip service for public consumption. Government, universities, boards and the profession could join together regularly in a teacher education forum, a consultative body which would examine constructively issues affecting development of teachers. The advantages and disadvantages of quota systems vs job prospects information could be threshed out openly in such a forum. Mechanisms for regular, up-to-date analysis and projection of teacher demand by subject area could be established regionally and provincially with an associated publicity program so that current and prospective teacher education students would have maximum information on job prospects by subject area, by type of institution, region, etc.

# SECTION II

## SUMMARY DESCRIPTION OF THE FLEXOR* TEACHER EDUCATION ANALYTICAL MODEL, ITS USES, AND A DISCUSSION OF CRITICAL VARIABLES

## SECTION II SUMMARY DESCRIPTION OF THE FLEXOR* TEACHER EDUCATION ANALYTICAL MODEL, ITS USES, AND A DISCUSSION OF CRITICAL VARIABLES

### Summary Description of the FLEXOR* Teacher Education Analytical Model

The FLEXOR* Teacher Education Analytical Model consists of two modules - a school teacher module and a teacher education module. It is computerized and constructed in such a way that variables may be easily altered for policy analysis, simulation, and experimentation. It is designed to be used for sectoral analysis (elementary, secondary, or combined) and is capable of application to data at the regional, individual institution, and local board levels.

The first section of the model, The School Teacher Module, develops the initial crucial input - the number of school teachers that will be required in future years. These estimates are generated from projections of numbers of pupils and values of pupil/teacher ratios either to be expected as a matter of policy or to be experimented with. Projected teacher withdrawal rates (experimental or by trend extrapolation) for various reasons (family reasons, retirement, change to another occupation, etc.) are then applied to yield projected number of teacher withdrawals and, by subtraction, the projected number of teachers continuing into the following year. The number of continuing teachers is subtracted from the number of teachers required in the same year to generate additional teachers to be acquired. Acquisition proportions are projected (experimentally or from trend extrapolations) to generate expected acquisitions of additional teachers proportioned among the various sources of acquisition (from teacher education institutions, returning teachers, from the part-time pool, etc.). The number of teacher education institution graduates required as new teachers is thus generated.

The Teacher Education Module accepts as input the number of teacher education institution graduates required as new teachers. Projected teacher education institution admissions to graduations ratios (experimental or by trend extrapolation) are applied to yield the number of students projected as required for admission to teacher education institutions to satisfy the demand for teacher education graduates. The age distribution of teacher education institution faculty is evaluated along with other mobility, outflow, and inflow factors to yield projected net faculty outflow (or inflow) and by subtraction, the number of faculty in the ensuing year. Admitted student to faculty ratios are then computed. The faculty average salary is increased by an appropriate annual career progress factor. The faculty salaries proportion of total

SECTION II

Summary Description of the FLEXOR* Teacher Education Analytical Model - Continued

operating cost (experimental and trend extrapolation) is projected and combined with projected numbers of faculty and average faculty salary to generate academic salary costs. Other major costs of operation are similarly projected. Operating costs and increases from year to year per graduating student immediately employed and per student admitted are then calculated.

Uses of the Model

In using the model the decision-maker may choose from among several options of variable alteration and design of experiments. (1) He may choose to assign a specific value to a variable as a matter of policy to see its impact eg., set the elementary pupil/teacher ratio at 20/1 in 1978-79 and see what happens. (2) He may choose to have the model examine a historical time series and extrapolate a trend into the future eg., project a teacher withdrawal trend over the next ten years. (3) He may choose to experiment with changes to values of a specific variable eg., vary the ratio of admissions to graduates to test the sensitivity of intake to changes in this variable. (4) He may wish to hypothesize specific types of future states of the teacher education system and assign values to variables which reflect the future states. (5) He may wish to design experiments where values of several variables are altered in a planned way and results analysed for significance of variation.

A Discussion of Critical Variables and Uncertainty in Projecting Variable Values

FLEXOR* model variables and factors influencing the values of the variables are described in Appendix 1. A discussion of the key variables and uncertain elements associated with them follows.

THE SCHOOL TEACHER MODULE

The key variables in the school teacher module are: projected enrolment pupil/teacher ratio withdrawal rates (for various reasons): and in-hire proportions (from various sources).

Enrolment Projections Table 1 shows the Watson/Quazi Estimate 1 projections for the Province of Ontario, 1977-86. This projection

A Discussion of Critical Variables and Uncertainty in Projecting Variable Values - Continued

was used for the simulations described in Section III. While fertility rates could affect the elementary projections in later years, the numbers shown for secondary represent children already born. Unless immigration rates change drastically these projections should hold up pretty well. If so, there will be a cumulative 7% decline in elementary and 18% in secondary, a combined decline of about 10% by 1986-87.

Pupil/Teacher Ratios: The elementary pupil/teacher ratio is now at about 23.5/1. In the early sixties it was slightly over 30/1 and has progressively declined to the present value. A trend line applied to the most recent values of this variable would project a decline to about 21/1 by 1986-87. This is a key policy variable. of course, and while it will probably not go as low as 21/1 by that date. we look for a modest decline from the present level.

The 1977-78 secondary pupil/teacher ratio is now about 17/1. During the late fifties and early sixties it was about 23/1. The ratio reached a low of about 16.4/1 in 1969 and has increased to 17.0 to 17.5/1 over the past several years. We anticipate that the value of this variable will average about 17/1 over entire simulation period 1978-1986. Of course, this is also a key policy variable which can be altered in various ways for impact evaluation.

School Teacher Withdrawal Rates: Withdrawal from the teacher force occurs for several reasons: resumption of family responsibilities; retirements; shift from full-time to part-time; change of occupation; promotion to a supervisory position; seeking of further education, etc.. The Ministry of Education maintains data files on the various reasons for leaving and analysis of these files shows a progressive downward trend from about 13% to 11% for Elementary from 1969-70 through 1975-76. For Secondary it was about 11% in 1969-70 and decreased to just over 6% in 1975-76. Indications are that each declined by at least a couple of percentage points in 1976-77. With the tight market projected for the next few years it is difficult to see much of an increase in either of these withdrawal rates. Thus. for the simulations described in Section III, the values have been set at 6.00 and 4.00 respectively for Elementary and Secondary. It is entirely possible that we could see a bottoming out of this variable however, to be followed by resumption of an upward trend coincident with improvement of the job market and an upturn in the economy. In such an event there would be less tendency for teachers to

A Discussion of Critical Variables and Uncertainty in Projecting Variable Values - Continued

cling tightly to their present positions. In our view this is the more likely event, so the 6.00% and 4.00% withdrawal rates should be viewed as pessimistic - certainly for the long term. In fact, the one variable that we can project with some certainty, ie., retirement, now just over 1%, begins to increase in the early nineties and this is reflected in the increasing values of withdrawal rates in the early nineties (Projected in the 2001 simulations of Section V).

Acquisition of New Teachers: New full-time teachers are obtained from several sources: from the pool of graduates of the teacher education institutions; former teachers re-entering the profession; part-time teachers converting to full-time; teachers in-migrating from other jurisdictions; and teachers given temporary assignments. The Ministry of Education files show that historically the main source of supply has been the pool of graduates from the teacher education institutions and reentering former teachers. For example, the respective proportions of the total new teachers hired in 1969-70 were 54% and 23%. The latter stayed at about the same level with some considerable variation, through 1975-76 while the former was on a downward trend before a slight upturn to 43% in 1975-76. Over this same period the average for new graduates was 45%, with a slight downward trend. The average for re-entering former teachers over the period was about 24%.

What these proportions will be in the future is anyone's guess. In any case, they will be dependent upon government, board and teacher federation policies in respect of the size and composition of the teacher force; on the economy which affects withdrawal rates; on policies which will influence the choice of the supply pool, ie., new graduates, re-entering former teachers, or other sources. This is a very important variable. If the new graduates proportion is high, the market for new young teachers is favourable. If protectionism results in the new graduates proportion being low, the student-flow into and out of teacher education institutions will decline. The simulations of Sections III and V reflect assumptions of optimistic (50%) and pessimistic (20%) views (from the viewpoint of the aspiring young teacher). It will be noted later that we favour the optimistic view with respect to the variable of proportion of teachers to be hired from the pool of recent graduates of teacher education institutions.

SECTION II

A Discussion of Critical Variables and Uncertainty in Projecting Variable Values - Continued

THE TEACHER EDUCATION MODULE: FACULTY AND STUDENTS SECTION

The key variables in the faculty and students section are: the teacher education institutions' admissions (preservice) to graduates hired ratio; the inservice training proportion; the teacher education institution student faculty ratio; and faculty turnover rates.

Admissions (Preservice) to Graduates Hired: Applicants are admitted to teacher education institutions each year. Some attrition during the program is to be expected so that fewer numbers graduate than the numbers admitted. Those who do graduate form a large portion of a supply pool of new teachers without previous experience.

Many who graduate search for teaching jobs along with graduates of the previous years (mainly the two previous years), former experienced teachers who would like to re-enter the profession, teachers immigrating from other jurisdictions, etc. This is a critical variable for the teacher education institutions. A low admissions to graduates-hired ratio would reflect a manpower planning approach, ie., trained teachers would be produced mainly to supply elementary and secondary schools in Ontario. It could also mean that the profession has difficulty attracting new entrants. A high ratio would reflect the view that training for teaching is valuable in other occupations.

This variable has fluctuated considerably in the past at both the elementary and secondary levels. For teachers trained at the elementary level, the ratio was about 2.0 in 1970-71, dropped to about 1.3 in 1971-72, 1.2 in 1972-73, 0.7 in 1973-74 and 1974-75 and rose to about 1.2 in 1975-76. Presuming the statistics in file are correct the value of 0.7 in 1972-73 and 1973-74 can only mean that the number of graduates hired from the new graduate supply pool in these two years was about 40% higher than the number of applicants admitted to the teacher education institutions. The elementary teacher average for the period 1970-71 through 1975-76 was about 1.2.

At the secondary level the ratio has been much higher, on an increasing trend from about 1.5 in 1970-71, to 1.8 in 1971-72, 2.6 in 1972-73, 2.0 in 1973-74, 2.5 in 1974-75, and 2.6 in 1975-76. The average for the period was about 2.2. It is evident that, historically, many graduates prepared for secondary teaching have not been immediately employed by secondary schools in Ontario.

SECTION II

A Discussion of Critical Variables and Uncertainty in Projecting Variable Values - Continued

What values should these variables take on for planning purposes? From the viewpoint of the teacher education institutions.high values would protect their enrolment levels and thus enable them to avoid difficult contraction decisions. (This is assuming, of course, that students do not exercise a negative vote with their feet and simply not apply.) From the viewpoint of government and society, a low value might be more appropriate for easing demands on the public purse and preventing a condition of too many trained teachers competing for too few teaching jobs. The simulations of Section III and V provide for alternatives of 1.25 (a manpower planning rate) for this ratio for both elementary and secondary, or for a combined elementary-secondary value of 1.56 ± 0.03 (an open-door rate) resulting from application of 1.4 and 2.0 values for elementary and secondary respectively. Two of the simulations of Section III allow this ratio to float to test the feasibility of allowing the preservice admission levels recommended by a recent COU report, Realignment of Priorities for Teacher Education, A Status Report on the Ontario Faculties of Education, January 1978.

Number of Inservice Admissions: The aforementioned COU report proposes that inservice education should receive higher priority in the teacher education institutions, but it does not recommend specific numbers or proportions of the teacher force either for the Province as a whole or by institution. The assumptions of all simulations of Sections III and V are that the FTE of inservice enrolment at Faculties of Education is now about 1000 (a head count of 6,000 representing about 6.5% of the present teacher force) and that it ought to rise to an FTE of about 1700 over a ten-year period (a head count of about 10,000 representing slightly more than 11% of the teacher force). The new teacher education regulations, training for other panels and other subjects, etc., should contribute to increasing demand for inservice education. Such assumptions as these above and the proper distribution of inservice and preservice education by institution and for the province as a whole should be discussed and tested by further simulations using alternative but reasonable values.

Student/Faculty Ratio: The combined preservice and inservice enrolment for both elementary and secondary is estimated to have been about 6700 FTE in 1977-78. The number of faculty is estimated to be about 540, thus the average student faculty ratio for the teacher education institutions is estimated to have been about 12.4 in 1977-78.

A Discussion of Critical Variables and Uncertainty in Projecting Variable Values - Continued

An analysis of faculty age distributions shows that retirement rates will remain at low levels through the mid-eighties (1% to 2%) and begin to increase to a level of about 6% in the mid-nineties. For the simulations of Section III it is assumed that other faculty outflows plus retirements will sum to 3% for each year through 1986-87. The student-faculty ratio is derived for each year by dividing pre-service and inservice admissions for the year by the number of faculty for the year. For the simulations of Section V for the period 1978-2002, as retirement rates increase beginning in the late eighties inflows of new faculty are allowed and the net outflow is reduced to zero in the mid nineties, ie., faculty numbers remain constant but there is considerable turnover with faculty inflows matching outflows.

THE TEACHER EDUCATION MODULE: OPERATING COST SECTION

The key variables of the operating cost section of the teacher education module are: average faculty career progress factors; average faculty salary; distribution of operating costs among major salary and non-salary accounts; total operating cost change from year to year; inservice/preservice cost ratio; cost per student; cost per graduate hired; index of cost per student; index of cost per graduate hired.

Career Progress Factors (%): University faculty associations have recently been able to negotiate agreements which feature annual career progress increments of over 2%. However, with inflation averaging 8 - 9 % and total increases to salaries lucky even to approach this, the net effect is that average career progress, in real terms, is reduced to zero or even a negative value. It is unlikely that this situation will change much in the short term unless there is a dramatic upturn in the economy and higher education once more becomes a high priority. Since neither of these events is likely, we are projecting a zero career progress factor for faculty salaries through the mid-eighties after which progressive improvements are made to reach a final level of 1% at the turn of the century.

Average Faculty Salary: The 1977-78 average faculty salary is estimated to be $30,000. With a net career progress annual rate of zero, the average salary remains at $30,000 through 1986-87 in the simulations of Section III. For the 2001 simulations of Section V the average salary remains at $30,000 through 1986-87 and increases at an increasing rate thereafter to a level of $33,300 in 2001.

SECTION II

A Discussion of Critical Variables and Uncertainty in Projecting Variable Values - Continued

Operating Cost Distribution: The present average distribution of operating costs in teacher education institutions is roughly as follows: 50% faculty salaries; 10% non-academic staff salaries; 7% fringe benefits; 6% equipment and supplies; 3% utilities and taxes; and 24% all other operating costs. This breakdown has been provided to allow for examining the impact of altering the proportion of the budget consumed by faculty salaries. In the model, the total operating budget is strictly a function of faculty salaries. For example; 540 faculty members at $30,000 each, consuming 50% of the operating budget equals a total operating cost of $32,400,000. If the model is instructed to reduce the total operating cost by 3% per annum meanwhile maintaining the $30,000 average salary and a 50% faculty salaries proportion of the budget, the variable which remains to accept the reduction is number of faculty. With retirement rate as projected, the model forces enough outflow that the total operating cost constraint is not breached. Thus, in the second year of the simulation:

$$0.97(\$32,400,000) \cong \frac{(\$30,000)}{0.50} \times 524.$$

Alteration of the 50% factor or the $30,000 average salary, or both, along with the number of faculty are possible. For the simulations of Sections III and V the 50% faculty salaries proportion is maintained over all years and the other components of operating cost do not enter the calculations.

Total Operating Cost and Percent Operating Cost Change: For the simulations of Section III the total operating cost declines at the rate of 3% per year through 1986-87. This is based on the assumption that if inflation is held at 6%, for example, the universities will receive an increase of 5% and teacher education institutions within the universities will receive an increase of 3%. Thus, the net change, in current dollars, is -3%. The judgment implied is that universities will fall slightly below average in government's priorities and that teacher education institutions will fall even lower in the universities' internal priority rankings. For the 2001 simulations of Section V it is assumed that the austerity pattern will begin to relax beginning in 1987, and that teacher education institutions will begin to receive more favourable budgetary treatment. In the late nineties the total operating cost is expected to increase by 1% per annum.

Inservice/Preservice Cost Ratio: At this time some inservice education is conducted with funding at a level below that of 2 BIU's per

A Discussion of Critical Variables and Uncertainty in Projecting Variable Values - Continued

student. Thus, the inservice/preservice unit cost ratio is under 1.0. We estimate the present ratio to be 0.80. Also, we are projecting that as inservice education assumes higher priority it will begin to be funded at levels closer to full BIU value. The simulations of Section III project a steadyincrease in this ratio to 0.90 in 1982-83 through 1986-87. For the simulations of Section V the ratio is assumed to be 1.0 from 1987-88 through 2001-02.

Cost per Student: Cost per student is determined each year by dividing the annual operating cost by the number of preservice and inservice students (FTE) admitted that year. In 1977-78 the average cost per student is estimated to be $32,400,000/6720 ≅ $4,821.

Cost per Graduate Hired: The cost per graduate hired from a preservice education program is determined as follows:

$$\text{Cost per Graduate Hired in Year X + 1} = \frac{\text{Preservice Share of Budget in Year X}}{\text{Number of Graduates Hired in Year X + 1}}$$

where preservice share of budget is,

(Cost per preservice student)(Number of preservice students)

and, cost per preservice student is,

$$\frac{\text{Total Operating Cost}}{\left(\text{Number of Preservice Students}\right) + \left(\text{Inservice/Preservice Cost Ratio}\right)\left(\text{Number of Inservice Students}\right)}$$

Thus, for determination of 1977-78 unit cost per graduate hired, the cost per preservice student is:

$$\frac{\$32,400,000}{(5,700) + 0.8(1,023)} = \$4,971$$

The preservice share of the budget is,

$$(\$4,971)(5,700) = \$28,334,700$$

and the cost per graduate hired in year X + 1 is,

$$\frac{\$28,334,700}{2,205} = \$12,850.$$

A Discussion of Critical Variables and Uncertainty in Projecting Variable Values - Continued

Cost per Student Index: The 1977-78 cost per student is indexed to 1.00 and all cost per student values in succeeding years are divided by the estimated 1977-78 unit cost to yield an index of cost per student relative to the base year cost. Thus, a projected average cost per student of, say, $9,892 in 1980-81 would yield an index of 2.05 relative to the 1977-78 cost per student. In other words, the per student cost is expected to double under the assumptions of the particular simulation that produces this value.

Cost per Graduate Hired Index: The 1977-78 cost per graduate hired is indexed to 1.00 and all cost per graduate hired values in succeeding years are divided by the estimated 1977-78 unit cost to yield an index of cost per graduate hired relative to the base year cost. A projected average cost per graduate hired of, say, $23,103 in 1980-81 would yield an index of 1.80. In other words, the cost per graduate hired from a preservice program is expected in increase by 80% over the 1977-78 unit cost.

# SECTION III

# SIMULATION EXPERIMENTS ON THE FLEXOR* TEACHER EDUCATION ANALYTICAL MODEL, 1977-78 THROUGH 1986-87

## SECTION III SIMULATION EXPERIMENTS ON THE FLEXOR* TEACHER EDUCATION ANALYTICAL MODEL, 1977-78 through 1986-87

Appendix 1 describes the model variables, values of which may be driven by environmental factors, policy decisions, or algorythmic operations internal to the model. The model is programmed to show simulated results for 20 years in the elementary, secondary and combined modes.

The starting point for the simulation experiments is 1977-78. The variable values for this base year are the best estimates possible at this time. The bottom lines for the model are indexes of cost per student and cost per graduate hired (1977-78 = 100). If there is concern about the values of the variables in the base year the index rows of unit cost changes will show relative unit costs irrespective of the 1977-78 base values.

The following simulations were run using the most recent Watson-Quazi projections (Projection #1) of public and separate school enrolments and the following variable values:

Type of Simulation and Variable Alterations 1977-78 through 1986-87 (Variable Names in Italics)

SIMULATION #1 Basic Scenario

*Elementary pupil/teacher ratio* moves from 23.5 to 22.0.
*Secondary pupil/teacher ratio* moves from 17.0 to 16.0.
*Combined pupil/teacher ratio* moves from 20.96 to 19.85.
(This is an assumed likely environmental development.)
*Percent withdrawals of school teachers* assumed at 6.00%, 4.00% and 5.00% for all years respectively for Elementary, Secondary and Combined sectors. (Assumed environmental development).
*Percent of teachers to be hired from teacher education institutions* assumed at 50% in 1977-78, 40% in 1978-79, 30% 1979-80, and 20% for succeeding years for both elementary, secondary and the combined sectors. (Assumed environmental development).
*Number of admissions (pre-service) per teacher education institution graduate hired* for Elementary moves from 2.14 in 1977-78 to 1.77 in 1978-79 and levels off at 1.40 in subsequent years. For Secondary, the ratio moves from 2.16 in 1977-78 to 2.08 in 1978-79 and levels off at 2.00 in subsequent years. For the combined mode the resulting ratios are 2.15, 1.86, 1.57, 1.48, 1.43, 1.43, 1.44, 1.55, 1.57, 1.54. (This is the key policy variable which reflects admissions policy related to graduates placed in teaching positions in schools.)
*Number of in-service admissions* assumed to increase by 5.2% per annum for both Elementary, Secondary and the Combined sectors, an overall increase of 66% in 10 years. (This is to reflect likely

SIMULATION #1 Basic Scenario (Continued)
*Number of in-service admissions*

environmental and policy developments. There is likely to be a demand from current teachers for more inservice training and government is likely to encourage training for improvement and competence in other subject areas).

*Percent teacher education institution faculty outflow* estimated from retirement rate projections, other projected outflows and forced outflows arising from budget constraints. Net outflow assumed at 3% per annum for both sectors for all years. (This constraint is consistent with the constraint on total budget below.)
*Career progress payments (%) to teacher education faculty* assumed at 0% each year for both sectors. (This is estimated to be the result of university budget constraints causing faculty salaries to increase by 2 to 3 percentage points less than inflation.)
*Total operating cost of teacher education institutions* assumed to decline by 3% per annum in real terms each year for all years for both sectors. (This is estimated to be the result of university budget constraints arising directly from Ministry funding policy).
*Inservice/preservice cost per student ratio*assumed at 80% in 1977-78, increasing steadily to 90% in 1982-83 and leveling off at this value in subsequent years. (Inservice courses have not always been funded at as high a level per student as preservice. The increase to 90% reflects a judgment that this ratio will improve but that it will not reach 100%).

SIMULATION #2 COU Realignment Scenario

For Simulation #2, the total elementary and secondary preservice admissions were fixed at the values suggested in the COU report, Realignment of Priorities for Teacher Education, A Status Report on the Ontario Faculties of Education, January, 1978, Table 4 page 27. For this simulation the variable *admissions (preservice) per graduate hired* was allowed to float. Values for other variables were set as in Simulation #1.

SIMULATION #3 COU Realignment, Capacity Absorption Scenario

For Simulation #3, the variable *admissions (preservice) per graduate hired* was fixed as for Simulation #1 and the variable *number of inservice admissions* was allowed to float to a level where the total of preservice and inservice admissions would be slightly higher

SIMULATION #3 COU Realignment, Capacity Absorption Scenario (Continued)

than that of Simulation #2. It should be noted that the COU realignment report contained no recommendations at all on the desirable level of in-service enrolment or its distribution to institutions - a most unusual omission in view of the report's emphasis on realignment toward in-service education.

SIMULATION #4 Reduced Annual Salaries Scenario

For Simulation #4, the variable *average academic salary* was reduced by 2% per annum in real terms. Values of other variables were set as in Simulation #1.

SIMULATION #5 Tight Budget Scenario

For Simulation #5, the variable *total operating cost* was reduced by 5% per annum in real terms for a total reduction of 35% over 10 years.

SIMULATIONS #6 through #10 are the same scenarios as #1 through #5 respectively except that for these scenarios the variable *percent of teachers to be hired from teacher education institutions* was set at 50% for all years of the simulation. (The average value of this variable during the period 1969-75 was about 46%.).

Tables 2 and 3 below show some essential teacher education institution decision information for the initial year, two intermediate years, and the final year of the simulations.

The startling immediate decline in preservice admissions from 5,694 in 1977-78 to 1,741 in 1980-81 becomes apparent in Simulation #1 mainly as a result of a low hiring rate prediction (20%). The combined student/faculty ratio also sinks to a very low level and the index of cost per student more than doubles through 1983-84.

Application of reasonable planning targets for inservice admissions shown in Simulation #2 would produce preservice admissions ratios over 6, ie., for every six admissions only one graduate would be placed. The index of cost per graduate hired more than doubles through 1983-84.

Simulation #3 shows what happens when preservice admissions are held to Simulation #1 values while allowing inservice admissions to float to a level where the totals of preservice and inservice are about 120% of the preservice admission level of Simulation #2.

Simulations #2 and #3 tend to show that the COU realignment proposals are unrealistic. In #2 the preservice admission ratio is unacceptably high. In #3 the inservice numbers are unreasonable. A head count in excess of 25,000 school teachers would be necessary to provide an FTE inservice enrolment of 5,500.

Simulation #4 was designed as an experiment to show that if salary increase demands are held to a level of -2% per annum in real terms, additional new faculty can be in-hired while the budget remains within the overall constraint of -3% per annum. Of course, this also results in a lower student/faculty ratio than is shown for Simulation #1.

Simulation #5 reduces the budget by 5% per annum in real terms. This experiment results in some additional forced outflows of faculty with a consequent increase in student/faculty ratio over that of Simulation #1.

Simulations #6 through #10 are duplicates of #1 through #5 except for the 50% factor for percent of new graduates hired. Because this factor is considerably higher, preservice admissions values in #6, #8, #9, and #10 are higher. The number of inservice enrolments required to make the COU realignment proposals reasonable (Simulation #8) is reduced considerably - to an FTE of 3,500, or a head count of close to 20,000. This number is still very high however and probably not feasible. It will be noted also that the preservice admissions ratio of the COU proposal (Simulation #7) is still unacceptably high.

Simulation #11 was conducted on the basic scenario of Simulation #1 with the variable percent of new graduates hired set at 40% for the period 1980-86. As expected, this shows smaller preservice enrolments than #6 and lower student faculty ratios. It is possible that this simulation might be viewed as a lower limit planning scenario.

# SECTION IV

# DEVELOPMENT OF PLANNING TARGETS

# 1986-87

## SECTION IV DEVELOPMENT OF PLANNING TARGETS 1986-87

It is evident from the simulations and from the data contained in Tables 2 and 3 that the period 1980-81 thru 1983-84 represents the low phase of cyclic activity after which the combined effects of stabilized and/or growing enrolments and faculty attritions begin to produce marginal gains.

Planning for allocation of resources to meet projected demands should not be based on the low point of cyclic activity. If such were the case, the very low projected 1982-83 enrolments in teacher education institutions for secondary preparation (in the range of 100 to 300) would dictate closing or severely curtailing the secondary - oriented faculties of education at U of T and Queens.

Rather the planning target(s) ought to approximate the mean level of activity and the planning period considered ought to encompass a time span of more than just a few years - rather more like 10 to 30. The 1986-87 values of Simulation #6 a decade hence, have been selected as reasonable target values for planning purposes. For the combined elementary and secondary sectors, the target values of key teacher education institution variables would be as follows: Preservice admissions to graduate hired ratio = 1.54; Number of preservice admissions = 3,500; Number of inservice admissions = 1,700; Student/faculty ratio = 12.61; Index of cost per student = 0.99

Table 4 has been constructed to show alternate patterns of 1986-87 enrolment by institution compared to MCU funded preservice, inservice and total enrolment in 1977-78. Pattern 1 allocates total preservice and inservice enrolment according to the 1977-78 proportions of enrolment at each institution. Pattern 2 represents an arbitrary redistribution of the major share of the inservice enrolment to Toronto, Queens, Western and Ottawa, with Brock, Laurentian, Windsor and York picking up the difference in preservice enrolment. In Pattern 3 it is assumed that the OTEC's will have been closed and that the released preservice enrolment would distribute largely to Brock, Toronto, Western, Windsor and York. Other patterns are also possible. Patterns 2 and 3 represent our best guess of the way preservice and inservice enrolment would distribute assuming totals shown and no provincial policies on limited enrolment by institution.

Table 5 shows an estimate of 1977-78 student and faculty numbers and projected 1986-87 student/faculty ratios at the insitutions assuming the Pattern 2 enrolment and that retirement occurs according to present faculty age distributions at each institution. It is important to emphasize that this is not a recommended pattern. It is simply one example of how enrolment and faculty might be distributed in 1986-87.

Table 5 shows that if the enrolment were to be distributed according to Pattern 2 and if Faculties of Education and the OTEC's were to retire as projected with no in-hires, a reasonable overall student/faculty ratio would exist in the system. This means that if diseconomies and inefficient allocations of resources inherent in the declining enrolment period of 1978-79 thru 1984-85 can be tolerated, a relatively effective system can exist in 1986-87 with the same number of institutions in existence at this time.

It is recognized however, that the price of maintaining all institutions thru these years may be considered too high. Our own preferred recommendation would be to ride it out and not close any. The simulations and Table 5 show that reasonable student/faculty ratios could exist at all institutions in 1986-87 owing to expected faculty attritions in prior years. Although no acceptable economic analysis of the alternative total costs of closing and reopening versus continuing operation is available (or possible, in our view), the costs of the former alternative would be very high. When such costs are combined with the political costs of closure (Note the recent attempts to close Algoma College) it would seem that continuing operation is the preferred alternative. However, these are decisions which must be made by the universities and government together -- the universities because they have responsibility for the faculties of education and government, because of education faculty agreements with universities and because of its direct control over OTEC's.

Without pretending that they are completely sufficient we would suggest that the following factors should be taken into account when and if closure is considered:

1. The commitment of the university to maintain a strong faculty of education despite declining enrolments. ie., the faculty is seen as a vital part of the university, not as an undesirable appendage to be disposed of when it ceases being a profitmaker.

2. The quality of the program and its graduates measured by the extent to which graduates of the program are perceived as well qualified, desirable candidates and productive workers in education and related fields.

3. The degree to which the region is served by the institution located in the same region.

4. The proportion of the total university work that is accounted for by the education faculty.

The first item is important because universities have responsibility for the internal allocation of resources. One university may wish to sustain the faculty of education through a difficult period because it values the program. Another may see enrolment decline as an opportunity to dump a program that it never really wanted in the first place. The internal budget priorities of the universities will soon provide a glimpse of how universities will respond individually and collectively.

Unfortunately, we can only get a partial assessment of the second factor ie., the placement of graduates in elementary and secondary institutions. Education-trained graduates are usefully employed in other related fields; indeed, employment in these related fields ought to be exploited much more than it is. The attractiveness of graduates to employers is also a measure of the quality of education provided, particularly if the graduates find employment easily outside the immediate region.

The third factor may be measured by the degree to which graduates find employment in the region within which the teacher education institution is located.

The fourth factor may be important if the teacher education institution represents a significant part of the university. A decision on closure here might result in the eventual demise of the entire university.

Table 6 shows one way in which partial assessments of the 2nd and 3rd factors might be made. The Ministry of Education tapes were examined for data on graduates finding employment within the region and province by institutions for the years 1975, 1976, and 1977 as of September 1977. The percentages of graduates of the institutions for these years finding employment in the region and in the province are shown in Column 1. The 1977-78 enrolment proportions of each institution for elementary and secondary are shown in Column 2. The overall regional and provincial employment indexes of Column 3 are derived by weighting the elementary and secondary employment percentages by the proportion of each at each institution and finding the sum. For example, the regional index for Brock is derived as follows:

(38% Elementary x .86) + (36% Secondary X .14)

= 37.73% Regional Index - rounded to 38%

Similarly, for Brock's provincial index,

(59% Elementary x .86) + (57% Secondary X .14)

= 58.7% Provincial Index - rounded to 59%

The indexes are then ranked regionally and provincially. An overall combined index is then computed by averaging the regional and provincial indexes -- in other words, assigning a weight of 0.50 to each index. These overall ratings and rankings are shown in Column 4. Other weights to reflect preferences for regionalization or provincialization could be applied, of course. For example, if the preference were strongly for regionalized preservice education, weights of 0.70 and 0.30 could be applied respectively to the regional and provincial indexes.

Table 7 shows the education BIU's (undergraduate and graduate) at each institution related to the total BIU's earned by the university. This roughly reflects the proportion of the university's income earned by the Faculty of Education.

The institutions are ranked in order of income earned as a proportion of total income. This represents an attempt to assess the fourth factor.

Table 8 shows the rankings on all factors - regional and provincial indexes of graduate placement effectiveness, overall weighted rating of placement effectiveness, and proportion of income earned for the parent institution.

Tables 6 through 8 give information which might be helpful if and when decisions on closure or severe curtailment are contemplated by universities and government. For example, York ranks first on placement and 10th on income proportion. Both of these factors at the ends of the spectrums along with the university's priority ranking of Education should be considered in any closure or cutback decision. Nipissing shows the opposite extreme. It ranks low on placement but first on proportion of income earned. Education represents over half of the entire institution. Closure here would almost certainly mean closure of the entire institution.

The negative correlation generally exhibited between the factors of graduate placement and income proportion will make it very difficult to decide on which institution should be closed.

The evidence in Table 8 is also an important contributing factor leading to our recommendation that, barring unusual downside deviations from projected enrolment demand and resource allocation patterns, universities and government should avoid precipitate actions in deciding to close one or more institutions. By the time such decisions could be implemented, they may answers to problems that no longer exist.

# SECTION V

# SIMULATION EXPERIMENTS 1977-78 THROUGH 2001-02

SECTION V SIMULATION EXPERIMENTS 1977-78 through 2001-02

SectionIII described simulations conducted for analysis of the 1977-86 planning period. Subsequent to these simulations, the model was amplified to include the years 1987-2001. Revised and updated pupil enrolment estimates for the entire period 1977-2001 were supplied by Mr. Said Quazi. (Table 9). Mr. Quazi also provided data which allowed for improved estimates of school teacher attrition rates under alternative assumptions of retirement at (1) age 65 or (2) with age and years service equaling 90. With these data eight additional simulations were conducted as follows:

SIMULATION #12 Scenario reflecting low estimates of hiring of recent graduates of teacher education institutions, low admissions to graduates hired ratio, and schoolteacher retirement at age 65.

*Elementary pupil/teacher ratio* moves from 23.5 to 22.00 in 1983 and remains constant at 22.00 in following years.

*Secondary pupil/teacher ratio* moves from 17.00 to 16.00 in 1982 and remains constant at 16.00 in following years.

*Percent withdrawals of school teachers* assumed at 6.00% and 4.00% respectively for Elementary and Secondary until increased retirements of school teachers beginning in 1992 cause total withdrawals to increase accordingly.

*Percent withdrawal by retirement* of school teachers estimated from projected retirements at age 65.

*Percent of new teachers to be hired from teacher education institutions* assumed at 50% in 1977-78, 40% in 1978-79, 30% in 1979-80 and 20% in 1980-81 and subsequent years for both the elementary and secondary sectors.

*Number of admissions (pre-service) per teacher education institution graduate hired* moves from 2.15 in 1977-78 to 1.85 in 1978-79, 1.55 in 1979-80 and 1.25 in 1980-81 and subsequent years. (This is an assumed restrictive policy designed to correct problems of new teachers not finding suitable employment).

*Number of in-service admissions* assumed to increase steadily to reach a combined level of 1700 in 1986-87 and remain at this level in subsequent years.

*Percent teacher education institution faculty outflow* estimated from retirement rate projections, other projected outflows, and forced outflows arising from budget constraints. Net outflow is assumed at 3% per annum through 1986-87 following which year it decreases steadily to zero in 1994 and subsequent years. (This is

to reflect an easing of faculty attrition as a result of steadily increasing retirement rates and increased faculty turnover beginning in the early nineties.)

*Career progress payments (%) to teacher education faculty* assumed at 0% through 1986-87 and increasing steadily in following years to a level of 1.00% in 1996-97 and following years. (With an easing of faculty attrition there will be an accompanying increase in real payments for career progress.)

*Total operating cost of teacher education institutions* assumed to decline by 3% per year in real terms through 1986-87 and decrease steadily thereafter until it stabilizes at an increase of 1.00% per annum beginning in 1996-97.

*Inservice/preservice cost per student ratio* assumed at 80% in 1977-78 increasing steadily to 100% in 1987-88 and subsequent years. (This reflects an assumption that eventually there will be equal funding on a per-student basis).

SIMULATION #13 Scenario reflecting low estimates of hiring of recent graduates of teacher education institutions, high admissions to graduates hired ratio, and schoolteacher retirement at age 65.

For Simulation #13 the variable, *Number of admissions (pre-service) per teacher education institution graduate hired* for Elementary declines from 2.14 in 1977 to 1.77 in 1978 and stabilizes at 1.40 in 1979 and subsequent years. For Secondary, the ratio declines from 2.16 in 1977 to 2.08 in 1978 and stabilizes at 2.00 in 1979 and subsequent years. For the Combined sectors, the stabilization range is 1.45 - 1.65 beginning in 1979. (This is to reflect a liberalization of a restrictive policy on admissions. The view here would be that teacher education would be valuable in non-school teacher occupations.) Values for other variables were set as in Simulation #12.

SIMULATION #14 Scenario reflecting low estimates of hiring of recent graduates of teacher education institutions, a low admissions to graduates-hired ratio, and school teacher retirement at years of service plus age equal 90.

For Simulation #14 the variable, *Percent withdrawal for retirement* in the school teacher module was based upon estimates of retirement

using the 90 rule, ie., age and years of service equal 90. This reflects an optimistic (and unlikely) view that all teachers will retire at 90 years. All other variable values were set as for Simulation #12.

SIMULATION #15 Scenario reflecting low estimates of hiring of recent graduates of teacher education institutions, a high admissions to graduates hired ratio, and school teacher retirement at years of service plus age equal 90.

For Simulation #15 the values of the variable *Number of Admissions (preservice) per teacher education institution graduate hired* were set as for Simulation #13. All other variable values were set as in Simulation #14.

SIMULATIONS #16, #17, #18 and #19 are the same as #12, #13, #14, and #15 respectively except that a high estimate of hiring of recent graduates of teacher education is assumed. For these simulations the variable, *Percent of new teachers to be hired from teacher education institutions* is set at 50% for all years of the simulation.

Table 10 recapitulates the assumptions for Simulations #12 through #19.

# SECTION VI

# DISCUSSION OF SIMULATION RESULTS
# 1977-78 THROUGH 2001-02

## SECTION VI DISCUSSION OF SIMULATION RESULTS 1977-78 through 2001-02

Table 11 shows the values taken on by certain key variables under the differing assumptions of new teacher hiring rates (20% vs 50%), preservice admission ratios (1.25 vs 1.4 elementary and 2.0 secondary) and school teacher retirement rates (age 65 vs age plus years of service = 90).

Simulation #12 could be considered as the most pessimistic scenario (from the viewpoint of the teacher education institution). New teacher hiring rates are very low at 20%; school teachers do not retire until forced to at age 65; and preservice admissions are held to 125% of new graduates placed in teaching jobs.

With this scenario, number of preservice admissions sinks to a low of about 1000 during the eighties and rises very slowly to about 1300 at the turn of the century. (Inservice admissions are assumed constant for all simulations, representing approximately 10% of the FTE school teacher force taking some kind of inservice education annually.) Total admissions never rise much above 3,000 which is less than half the number of admissions in 1977-78. The student/faculty ratio in the teacher education institutions declines to about 5/1 in 1981-82 and rises slowly to 8/1 at the turn of the century. The index of cost per student rises to 2.55 in 1981-82 and stays above 1.6 thereafter. In other words,assuming a present operating cost per student of about $5,000, the projected constant dollar per student cost in 1981-82 would be about $12,750 in 1981-82 and would remain above $8,000 in following years. The index of cost per graduate hired rises to about 1.4 in 1981-82 after which the effects of low hiring and admission rates (producing low enrolment levels) begin to show in a lowered cost per graduate hired, about 0.78 in 1991-92 and 0.86 in the year 2001. Assuming a present cost per graduate hired of about $12,000, it would rise to over $16,000 in 1981-82, after which it would decline to between $9,000 and $10,000 for the rest of the century. In short, a pessimistic outlook would include (1) restrictive policies and/or environmental impacts on new school teacher hirings and admissions to teacher education institutions and (2) low school teacher attrition rates culminating in low enrolments, high student/faculty ratios and high operating cost per student and per graduate hired.

Given the long-term planning implications (over 20 years) if the assumptions of this scenario were reasonably close to what the future holds for teacher education it would be difficult for the universities and government to avoid closure and/or merger decisions.

Simulation #19 represents the other extreme, ie., an optimistic long-term scenario (from the viewpoint of the teacher education institution). New teacher hiring rates are high at 50%; school teachers retire as soon as age plus years of service equal 90; a liberal policy of preservice admission rates at about 1.55 is maintained. With this scenario preservice admissions decline to a low of about 3,100 in 1981-82 and rise steadily to above 7,000 in the year 2001. Total admissions in that year would be above 9,000. The student/faculty ratio in the teacher education institutions declines to a low of about 9/1 in 1981-82 and rises to about 23/1 in 2001. (Actually, this would not occur because hiring policies would be established which would cause the student/faculty ratio to stabilize at, for example, 14/1. In that event, of course, total and per unit costs would have to rise accordingly.) Of course, with this large increase in the student/faculty ratio, both indexes of cost per student and cost per graduate hired decline rapidly.

If this optimistic scenario were close to what the future holds for teacher education, no immediate closure decisions would seem indicated, and the teacher education institutions would be pressed to handle demand beginning in the early nineties.

It is likely that neither the pessimistic or optimistic scenario represent future reality. The combined effects of market forces (supply and demand), inertia, teacher federation actions, government and educational institution policies, etc., will cause moderation of the extreme decline characterized by #12 and a dampening of the fluctuations characterized by #19.

We believe simulation numbers 16 and 17 to be the more likely harbingers of the future. The percentage of new teachers hired will be close to 50% reflecting a desire to maintain vitality in the teaching force and to provide opportunities for new, young teachers. University policies on preservice admission ratios are unlikely to be as low as 1.25 or as high as 1.55. In an inflationary economy school teachers will tend to work until forced to retire. If this is so, simulation numbers 16 and 17 provide a range within which the future of Ontario teacher education lies. The key elements of this possible future are recapitulated in Table 12.

## Appendix 1 Description of FLEXOR* Model Variables and Factors Influencing Values of the Variables

| Model Variable | Type of Variable | Factors Influencing Variable Values |
|---|---|---|
| SCHOOL TEACHER MODULE | | |
| Elementary and Secondary School Enrolments | Exogenous | Fertility and school retention rates |
| | Policy | Immigration policies |
| Ratio of pupils to teachers | Policy | Current and projected enrolment levels<br>Budget constraints |
| | Endogenous | Values of other model variables |
| Number of school teachers | Endogenous | Values of above variables |
| | Policy | Board and ministerial decisions |
| School teacher withdrawal rates (%) | Exogenous | General economy and the job market |
| Family reasons, retirement, become part time, change occupation, upgrading, further education, all other reasons | Policy | Ministerial and board decisions |
| Number of continuing school teachers | Exogenous | Values of above variables |
| | Policy | Board decisions |
| Rate of acquisition of school teachers (%) | Policy | Ministerial and board decisions and budget constraints |
| New teachers, re-entering former teachers, become full time, in-migration, temporary, all other sources | Exogenous<br>Endogenous | Reentry rates<br>Values of above variables |
| Number of school teachers acquired | Endogenous | Values of above variables |
| | Policy | Ministerial and board decisions |
| | Exogenous | Number of school teachers available |

# APPENDIX 1

## DESCRIPTION OF FLEXOR* MODEL VARIABLES AND FACTORS INFLUENCING VALUES OF THE VARIABLES

Appendix 1 (Continued)

| Model Variable | Type of Variable | Factors Influencing Variable Values |
|---|---|---|
| TEACHER EDUCATION MODULE | | |
| Graduates of teacher education institutions acquired as new teachers | Endogenous | Values of above variables |
| | Policy | Ministerial and board decisions |
| | Exogenous | Number of graduates available |
| Ratio of preservice teacher education admissions to graduates acquired as new teachers | Policy | Ministerial and university decisions |
| | Endogenous | Values of other model variables |
| | Exogenous | Number and quality of applications to teacher education institutions |
| Number of admissions to teacher education institutions, preservice and inservice | Endogenous | Values of other model variables |
| | Policy | Ministerial and university decisions |
| | Exogenous | General economy and the job market. Number and quality of applications to teacher education institutions |
| Student/faculty ratio in teacher education institutions | Endogenous | Values of other model variables |
| | Exogenous | Outflows of faculty |
| | Policy | University hiring, retention and retirement decisions |
| Faculty outflows (inflows) at teacher education institutions (%) | Policy | University retention and retirement decisions |
| | Exogenous | General economy and the job market |
| | Endogenous | Values of other model variables |
| Career progress increase in teacher education faculty salaries (%) | Policy | University retention and retirement decisions. Collective bargaining agreements. University budget constraints and salaries policy |
| | Exogenous | General economy and the job market |

Appendix 1 (Continued)

| Model Variable | Type of Variable | Factors Influencing Variable Values |
|---|---|---|
| Average salary of teacher education faculty (Constant $) | Policy | Ministerial budget constraints and university salaries policy |
| | Exogenous | General economy and the job market |
| Operating cost distribution in teacher education institutions (%)<br><br>Faculty salaries, non-academic staff salaries, fringe benefits, equipment and supplies, utilities and taxes, all other expenses | Policy | Ministerial budget constraints and university budget decisions |
| | Exogenous | Inflationary pressures affecting budget categories |
| Total operating cost of teacher education institutions (Constant $) | Policy | Ministerial budget constraints and university budget decisions |
| | Endogenous | Values of other model variables |
| Annual total operating cost change (%) | Policy | Ministerial budget constraints and university budget decisions |
| | Endogenous | Values of other model variables |
| Ratio of inservice per student cost to preservice per student cost | Policy | Ministerial decisions on funding per student, student fees, and university budget decisions |
| Operating cost per student (Constant $) | Policy | Ministerial and university budget decisions |
| | Endogenous | Values of other model variables |
| Operating cost per newly-hired graduate of preservice teacher education program (Constant $) | Policy | Ministerial and university budget decisions |
| | Endogenous | Values of other model variables |

Appendix 1 (Continued)

| Model Variable | Type of Variable | Factors Influencing Variable Values |
|---|---|---|
| Index of operating cost per student (1977-78 = 100) | Policy | Ministerial and university budget decisions |
| | Endogenous | Values of other model variables |
| Index of operating cost of newly-hired graduate of a preservice teacher education program | Policy | Ministerial and university budget decisions |
| | Endogenous | Values of other model variables |

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TABLES 1 - 12

TABLE 1

PUBLIC AND SEPARATE SCHOOL ENROLMENT PROJECTIONS

FOR THE PROVINCE OF ONTARIO 1977-86 (Watson/Quazi Estimate 1)

| Year | Elementary | Cumulative % Increase (Decrease) | Secondary | Cumulative % Increase (Decrease) | Total | Cumulative % Increase (Decrease) |
|---|---|---|---|---|---|---|
| 1977-78 | 1,329,061 | | 615,232 | | 1,944,293 | |
| 1978-79 | 1,296,709 | (2.4) | 613,928 | (0.2) | 1,910,637 | (1.7) |
| 1979-80 | 1,273,840 | (4.2) | 601,903 | (2.2) | 1,875,743 | (3.5) |
| 1980-81 | 1,261,778 | (5.1) | 579,416 | (5.8) | 1,841,194 | (5.3) |
| 1981-82 | 1,257,484 | (5.4) | 552,799 | (10.1) | 1,810,283 | (6.9) |
| 1982-83 | 1,253,212 | (5.7) | 527,629 | (14.2) | 1,780,841 | (8.4) |
| 1983-84 | 1,247,121 | (6.2) | 511,302 | (16.9) | 1,758,423 | (9.6) |
| 1984-85 | 1,239,821 | (6.7) | 506,553 | (17.7) | 1,746,374 | (10.2) |
| 1985-86 | 1,235,921 | (7.0) | 505,811 | (17.8) | 1,741,732 | (10.4) |
| 1986-87 | 1,237,473 | (6.9) | 502,728 | (18.3) | 1,740,201 | (10.5) |

Table 2 Values of Key Teacher Education Institution Variables
Percent of New Graduates Hired Stabilized at 20% for 1980-86

| Simulation Number | and Year | Preservice Admissions Ratio | Number of Admissions | | Student Faculty Ratio | Per Annum Operating Cost Reduction | Index of Cost per Student | Index of Cost per Graduate Hired |
|---|---|---|---|---|---|---|---|---|
| | | | Preservice | Inservice | | | | |
| #1 | 1977-78 | 2.15 | 5,694 | 1,023 | 12.45 | | 1.00 | 1.00 |
| | 1980-81 | 1.48 | 1,741 | 1,248 | 6.07 | -3% | 2.05 | 1.80 |
| | 1983-84 | 1.44 | 1,167 | 1,473 | 5.87 | | 2.12 | 1.21 |
| | 1986-87 | 1.54 | 1,392 | 1,700 | 7.53 | | 1.65 | 1.05 |
| #2 | 1977-78 | 2.15 | 5,694 | 1,023 | 12.45 | Same as | 1.00 | 1.00 |
| | 1980-81 | 3.74 | 4,400 | 1,248 | 11.46 | #1 | 1.09 | 2.33 |
| | 1983-84 | 6.68 | 5,400 | 1,473 | 15.28 | | 0.82 | 2.08 |
| | 1986-87 | 6.43 | 5,800 | 1,700 | 18.26 | | 0.69 | 1.65 |
| #3 | 1977-78 | Same as | 5,694 | 1,184 | 12.74 | Same as | 1.00 | 1.00 |
| | 1980-81 | #1 | 1,741 | 3,539 | 10.71 | #1 | 1.19 | 1.04 |
| | 1983-84 | | 1,167 | 5,313 | 14.41 | | 0.88 | 0.50 |
| | 1986-87 | | 1,392 | 5,568 | 16.95 | | 0.75 | 0.50 |
| #4 | 1977-78 | Same as | Same as | Same as | 12.45 | Same as | 1.00 | 1.00 |
| | 1980-81 | #1 | #1 | #1 | 5.71 | #1 | 2.05 | 1.80 |
| | 1983-84 | | | | 5.20 | | 2.12 | 1.21 |
| | 1986-87 | | | | 6.28 | | 1.65 | 1.05 |
| #5 | 1977-78 | Same as | Same as | Same as | 12.45 | | 1.00 | 1.00 |
| | 1980-81 | #1 | #1 | #1 | 6.46 | -5% | 1.93 | 1.69 |
| | 1983-84 | | | | 6.65 | | 1.87 | 1.07 |
| | 1986-87 | | | | 9.08 | | 1.37 | 0.86 |

Table 3 Values of Key Teacher Education Institution Variables: Percent of New Graduates Hired Assumed Constant at 50% for all Years

| Simulation Number and Year | | Preservice Admissions Ratio | Number of Admissions | | Student Faculty Ratio | Per Annum Operating Cost Reduction | Index of Cost per Student | Index of Cost per Graduate Hired |
|---|---|---|---|---|---|---|---|---|
| | | | Preservice | Inservice | | | | |
| #6 | 1977-78 | 2.15 | 5,694 | 1,023 | 12.45 | | 1.00 | 1.00 |
| | 1980-81 | 1.48 | 2,902 | 1,248 | 8.42 | -3% | 1.48 | 0.85 |
| | 1983-84 | 1.44 | 2,918 | 1,473 | 9.76 | | 1.27 | 0.71 |
| | 1986-87 | 1.54 | 3.481 | 1,700 | 12.61 | | 0.99 | 0.60 |
| #7 | 1977-78 | 2.15 | 5,694 | 1,023 | 12.45 | Same as | 1.00 | 1.00 |
| | 1980-81 | 2.24 | 4,400 | 1,248 | 11.46 | #6 | 1.09 | 0.93 |
| | 1983-84 | 2.67 | 5,400 | 1,473 | 15.28 | | 0.82 | 0.83 |
| | 1986-87 | 2.57 | 5,800 | 1,700 | 18.26 | | 0.69 | 0.60 |
| #8 | 1977-78 | Same as | 5,694 | 1,184 | 12.74 | Same as | 1.00 | 1.00 |
| | 1980-81 | #6 | 2,902 | 2,378 | 10.71 | #6 | 1.19 | 0.67 |
| | 1983-84 | | 2,918 | 3,562 | 14.41 | | 0.88 | 0.49 |
| | 1986-87 | | 3,481 | 3,479 | 16.95 | | 0.75 | 0.50 |
| #9 | 1977-78 | Same as | Same as | Same as | 12.45 | Same as | 1.00 | 1.00 |
| | 1980-81 | #6 | #6 | #6 | 7.93 | #6 | 1.48 | 0.85 |
| | 1983-84 | | | | 8.65 | | 1.27 | 0.71 |
| | 1986-87 | | | | 10.52 | | 0.99 | 0.60 |
| #10 | 1977-78 | Same as | Same as | Same as | 12.45 | | 1.00 | 1.00 |
| | 1980-81 | #6 | #6 | #6 | 8.96 | -5% | 1.39 | 0.80 |
| | 1983-84 | | | | 11.06 | | 1.13 | 0.63 |
| | 1986-87 | | | | 15.22 | | 0.82 | 0.50 |
| Simulation #11 | | Most Likely Estimate with New Graduates Hired Percentage at 40% in 1980-86 | | | | | | |
| | 1977-78 | 2.15 | 5,694 | 1,023 | 12.45 | Same as | 1.00 | 1.00 |
| | 1980-81 | 1.48 | 2,322 | 1,248 | 7.24 | #6 | 1.72 | 0.99 |
| | 1983-84 | 1.44 | 2,335 | 1,473 | 8.47 | | 1.47 | 0.83 |
| | 1986-87 | 1.54 | 2,785 | 1,700 | 10.92 | | 1.14 | 0.70 |

Table 4 Alternative Patterns of Enrolment Distribution Assuming the 1986-87 Values of Simulation #6

| Institution | Undergraduate 1977-78 | | | Pattern 1 | | | Pattern 2 | | | Pattern 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre-service | In-service | Total | Pre-service | In-service | Total | Pre-service | In-service | Total | Pre-service | In-service | Total |
| Brock | 268 | | 268 | 165 | | 165 | 200 | 40 | 240 | 300 | 40 | 340 |
| Lakehead | 297 | 60 | 357 | 183 | 100 | 283 | 183 | 50 | 233 | 183 | 50 | 233 |
| Laurentian | 115 | 25 | 140 | 71 | 42 | 113 | 100 | 40 | 140 | 100 | 40 | 140 |
| Nipissing | 204 | 15 | 219 | 125 | 25 | 150 | 125 | 25 | 150 | 125 | 25 | 150 |
| Ottawa | 342 | 71 | 413 | 210 | 118 | 328 | 210 | 126 | 336 | 210 | 126 | 336 |
| Queens | 775 | 135 | 910 | 476 | 224 | 700 | 476 | 286 | 762 | 476 | 286 | 762 |
| Toronto | 1,408 | 471 | 1,879 | 865 | 782 | 1,647 | 787 | 691 | 1,478 | 1,026 | 691 | 1,717 |
| Western | 959 | 98 | 1,057 | 589 | 163 | 752 | 500 | 360 | 860 | 600 | 360 | 960 |
| Windsor | 303 | 148 | 451 | 186 | 246 | 432 | 275 | 54 | 329 | 300 | 54 | 354 |
| York | 205 | | 205 | 126 | | 126 | 140 | 28 | 168 | 180 | 28 | 208 |
| OTEC's | 818 | ? | 818 | 504 | — | 504 | 504 | — | 504 | — | — | — |
| Total | 5,694 | 1,023 | 6,717 | 3,500 | 1,700 | 5,200 | 3,500 | 1,700 | 5,200 | 3,500 | 1,700 | 5,200 |

Table 5 Estimated Number of Undergraduate Students and Full Time Faculty in 1977-78 and the Projected Student/ Faculty Ratio of Pattern 2, 1986-87

| | 1977-78 | | | 1986-87 | | |
|---|---|---|---|---|---|---|
| Institution | No. of FTE Students[1] | No. of Faculty[2] | Student/ Faculty Ratio | Total Enrolment of Pattern 2 | No. of Faculty Assuming Retirements and No In-Hires | Student/ Faculty Ratio |
| Brock | 268 | 15 | 17.9 | 240 | 10 | 24.0 |
| Lakehead | 357 | 21 | 17.0 | 233 | 18 | 13.0 |
| Laurentian | 140 | 12 | 11.7 | 140 | 12 | 11.7 |
| Nipissing | 219 | 15 | 14.6 | 150 | 13 | 11.5 |
| Ottawa | 413 | 52 | 7.9 | 336 | 44 | 7.7 |
| Queens | 910 | 76 | 12.0 | 762 | 68 | 11.2 |
| Toronto | 1,879 | 110 | 17.1 | 1,478 | 102 | 14.5 |
| Western | 1,057 | 97 | 10.9 | 860 | 82 | 10.5 |
| Windsor | 451 | 28 | 13.7 | 329 | 26 | 12.7 |
| York | 205 | 19 | 8.2 | 168 | 17 | 9.9 |
| OTEC's | 818 | 71 | 11.5 | 504 | 60[3] | 8.4 |
| Total | 6,717 | 516 | 13.0 | 5,200 | 452 | 11.5 |

1 Preliminary information from the Ministry of Colleges and Universities.

2 Undergraduate faculty numbers estimated from data provided by teacher education institutions. Total is not the same as used in simulations because this total is restricted to full time faculty.

3 Estimated from Statistics Canada data.

Table 6 Derivation of Effectiveness Ratings of Placement of Graduates in Elementary and Secondary Schools, 1975 through 1977

| Institution | Level | Column 1 Placement % Region | Column 1 Placement % Province | Column 2 Enrolment Proportion | Column 3 Overall Index Region | Column 3 Overall Index Rank | Column 3 Overall Index Province | Column 3 Overall Index Rank | Column 4 Overall Rating Rating | Column 4 Overall Rating Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| Brock | Elementary | 38 | 59 | 86 | 38 | 6 | 59 | 8 | 48 | 6 |
| | Secondary | 36 | 57 | 14 | | | | | | |
| Lakehead | Elementary | 42 | 53 | 37 | 35 | 7 | 51 | 12 | 43 | 10 |
| | Secondary | 31 | 50 | 63 | | | | | | |
| Laurentian | Elementary | 30 | 74 | 100 | 30 | 8 | 74 | 1 | 52 | 4 |
| Nipissing | Elementary | 19 | 61 | 100 | 19 | 11 | 61 | 6 | 40 | 11 |
| Ottawa | Elementary | 40 | 57 | 72 | 39 | 5 | 58 | 9 | 48 | 6 |
| | Secondary | 38 | 62 | 28 | | | | | | |
| Queens | Elementary | 23 | 58 | 20 | 16 | 12 | 56 | 11 | 36 | 12 |
| | Secondary | 15 | 55 | 80 | | | | | | |
| Toronto | Elementary | 40 | 49 | 2 | 48 | 3 | 62 | 5 | 55 | 3 |
| | Secondary | 48 | 62 | 98 | | | | | | |
| Western | Elementary | 28 | 66 | 39 | 25 | 9 | 68 | 3 | 47 | 8 |
| | Secondary | 23 | 70 | 61 | | | | | | |
| Windsor | Elementary | 49 | 59 | 67 | 46 | 4 | 57 | 10 | 51 | 5 |
| | Secondary | 40 | 54 | 33 | | | | | | |
| York | Elementary | 70 | 76 | 87 | 67 | 1 | 74 | 1 | 70 | 1 |
| | Secondary | 51 | 64 | 13 | | | | | | |
| Hamilton OTEC | Elementary | 25 | 66 | 100 | 25 | 9 | 66 | 4 | 45 | 9 |
| Toronto OTEC | Elementary | 53 | 60 | 100 | 53 | 2 | 60 | 7 | 56 | 2 |

Source: Ministry of Education Data Files

Table 7 Education BIU's and GFU's as a Percentage of Total BIU's and GFU's, 1977-78

| Institution | (1) Education BIU's and GFU's | (2) University BIU's and GFU's | 100(1)/(2) | Rank |
|---|---|---|---|---|
| Brock | 532.2 | 5,290.8 | 10.06% | 3 |
| Lakehead | 664.2 | 5,356.4 | 12.40 | 2 |
| Laurentian | 240.6 | 4,854.9 | 4.96 | 9 |
| Nipissing | 437.2 | 790.1 | 55.33 | 1 |
| Ottawa | 1,603.7 | 24,705.3 | 6.49 | 7 |
| Queens | 2,061.6 | 22,430.6 | 9.19 | 4 |
| Toronto | 3,758.2 | 68,569.9 | 5.48 | 8 |
| Western | 2,182.8 | 32,939.6 | 6.63 | 6 |
| Windsor | 1,149.2 | 15,401.8 | 7.46 | 5 |
| York | 263.5 | 25,314.4 | 1.04 | 10 |
| Total | 12,893.2 | 205,653.8 | 6.27% | |
| Total BIU's and GFU's all universities | | 322,083.3 | 4.00% | |

Table 8 Recapitulation of Institutional Rankings

| Institution | 1975-77 Graduate Placements | | | 1977-78 Income Proportion Rank |
|---|---|---|---|---|
| | Regional Rank | Provincial Rank | Overall Weighted Rank | |
| Brock | 6 | 8 | 6 | 3 |
| Lakehead | 7 | 12 | 10 | 2 |
| Laurentian | 8 | 1 | 4 | 9 |
| Nipissing | 11 | 6 | 11 | 1 |
| Ottawa | 5 | 9 | 6 | 7 |
| Queens | 12 | 11 | 12 | 4 |
| Toronto | 3 | 5 | 3 | 8 |
| Western | 9 | 3 | 8 | 6 |
| Windsor | 4 | 10 | 5 | 5 |
| York | 1 | 1 | 1 | 10 |
| Hamilton OTEC | 9 | 4 | 9 | N.A. |
| Toronto OTEC | 2 | 7 | 2 | N.A. |

**Table 9** Ontario Public and Separate School Enrolment Projections, 1977 through 2001.*

| Year | Elementary | Secondary | Total |
|---|---|---|---|
| 1977-78 | 1,328,193 | 613,830 | 1,942,023 |
| 1978-79 | 1,294,640 | 618,467 | 1,913,107 |
| 1979-80 | 1,262,551 | 615,883 | 1,878,434 |
| 1980-81 | 1,241,370 | 601,339 | 1,842,709 |
| 1981-82 | 1,224,558 | 585,035 | 1,809,593 |
| 1982-83 | 1,218,645 | 561,091 | 1,779,736 |
| 1983-84 | 1,213,866 | 538,528 | 1,752,394 |
| 1984-85 | 1,204,538 | 524,316 | 1,728,854 |
| 1985-86 | 1,194,299 | 518,480 | 1,712,779 |
| 1986-87 | 1,192,366 | 513,370 | 1,705,736 |
| 1987-88 | 1,195,410 | 511,484 | 1,706,894 |
| 1988-89 | 1,203,041 | 507,294 | 1,710,335 |
| 1989-90 | 1,209,885 | 500,075 | 1,709,960 |
| 1990-91 | 1,221,451 | 489,105 | 1,710,556 |
| 1991-92 | 1,230,490 | 485,341 | 1,715,831 |
| 1992-93 | 1,238,533 | 485,023 | 1,723,556 |
| 1993-94 | 1,245,022 | 488,341 | 1,733,363 |
| 1994-95 | 1,250,027 | 491,123 | 1,741,150 |
| 1995-96 | 1,253,360 | 496,855 | 1,750,215 |
| 1996-97 | 1,254,787 | 501,043 | 1,755,830 |
| 1997-98 | 1,254,575 | 504,719 | 1,759,294 |
| 1998-99 | 1,252,402 | 507,851 | 1,760,253 |
| 1999-2000 | 1,247,676 | 511,038 | 1,758,714 |
| 2000-01 | 1,240,847 | 513,984 | 1,754,831 |
| 2001-02 | 1,232,358 | 516,390 | 1,748,748 |

*Provided by Mr. Said Quazi, O.I.S.E.

Table 10 Simulation Recapitulation

| Variable Name | Assumptions and/or Values of Variables #12 | #13 | #14 | #15 | #16 | #17 | #18 | #19 |
|---|---|---|---|---|---|---|---|---|
| Elementary pupil/teacher ratio | Moves from 23.50 to 22.00 in 1983 and remains at this level thereafter. | | | | | | | |
| Secondary pupil/teacher ratio | Moves from 17.00 to 16.00 in 1982 and remains at this level thereafter. | | | | | | | |
| Percent withdrawal of school teachers | Assumed at 6% and 4% respectively for elementary and secondary until increased retirements beginning in 1992 cause total withdrawals to increase accordingly. | | | | | | | |
| Percent withdrawals by school teacher retirements | Age 65 | Age 65 | 90 Rule | 90 Rule | Age 65 | Age 65 | 90 Rule | 90 Rule |
| Percent of new teachers to be hired from teacher education institutions | 20% | 20% | 20% | 20% | 50% | 50% | 50% | 50% |
| Number of admissions (preservice) per teacher education institution graduate hired | Elementary 1.25 | 1.40 | 1.25 | 1.40 | 1.25 | 1.40 | 1.25 | 1.40 |
| | Secondary 1.25 | 2.00 | 1.25 | 2.00 | 1.25 | 2.00 | 1.25 | 2.00 |
| Number of inservice admissions | Assumed to increase steadily from 1,023 FTE in 1977-78 to 1,700 FTE in 1986-87 and following years. | | | | | | | |
| Net percentage of teacher education institution faculty outflow | Assumed at -3% per annum through 1986-87, decreasing steadily thereafter to a net of zero in 1994 and subsequent years. | | | | | | | |
| Career progress payments (%) to teacher education institution faculty | Zero percent through 1986-87, increasing steadily to 1.00% in 1996 and following years. | | | | | | | |
| Total operating cost of teacher education institutions | Decline of 3% per annum in real terms through 1986-87 and improving steadily thereafter to stabilize at an annual increase of 1.00% beginning in 1996-97. | | | | | | | |
| Inservice/preservice ratio of cost per student | Assumed at 80% in 1977-78 increasing steadily to 100% in 1987-88 and subsequent years. | | | | | | | |

Table 11 Values of Key Teacher Education Institution Variables, 1977-78 through 2001-02

| | Simulation Number and Year | Percent of New Teachers | Teacher Retirement Rate (%) | Preservice Admissions Ratio | # of Admissions | | Student/ Faculty Ratio | Index of Cost per Student | Index of Cost per Graduate Hired |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Preservice | Inservice | | | |
| #12 | 1977-78 | 50% | 1.15% | 2.15 | 5,698 | 1,023 | 12.45 | 1.00 | 1.00 |
| | 1981-82 | 20 | 1.16 | 1.25 | 1,011 | 1,323 | 4.88 | 2.55 | 1.38 |
| | 1986-87 | 20 | 1.13 | 1.25 | 1,037 | 1,700 | 6.66 | 1.87 | 0.86 |
| | 1991-92 | 20 | 1.18 | 1.25 | 1,182 | 1,700 | 7.68 | 1.64 | 0.78 |
| | 1996-97 | 20 | 1.58 | 1.25 | 1,311 | 1,700 | 8.09 | 1.62 | 0.81 |
| | 2001-02 | 20 | 1.89 | 1.25 | 1,277 | 1,700 | 8.00 | 1.73 | 0.86 |
| #13 | 1977-78 | 50 | 1.15 | 2.15 | 5,698 | 1,023 | 12.45 | 1.00 | 1.00 |
| | 1981-82 | 20 | 1.16 | 1.54 | 1,242 | 1,323 | 5.37 | 2.32 | 1.53 |
| | 1986-87 | 20 | 1.13 | 1.54 | 1,278 | 1,700 | 7.25 | 1.72 | 0.98 |
| | 1991-92 | 20 | 1.18 | 1.53 | 1,443 | 1,700 | 8.38 | 1.51 | 0.88 |
| | 1996-97 | 20 | 1.58 | 1.58 | 1,653 | 1,700 | 9.01 | 1.46 | 0.91 |
| | 2001-02 | 20 | 1.89 | 1.59 | 1,630 | 1,700 | 8.95 | 1.54 | 0.98 |
| #14 | 1977-78 | 50 | 1.15 | 2.15 | 5,698 | 1,023 | 12.45 | 1.00 | 1.00 |
| | 1981-82 | 20 | 1.16 | 1.25 | 1,011 | 1,323 | 4.88 | 2.55 | 1.38 |
| | 1986-87 | 20 | 1.20 | 1.25 | 1,064 | 1,700 | 6.73 | 1.85 | 0.87 |
| | 1991-92 | 20 | 1.70 | 1.25 | 1,307 | 1,700 | 7.59 | 1.66 | 0.76 |
| | 1996-97 | 20 | 3.53 | 1.25 | 1,777 | 1,700 | 8.78 | 1.50 | 0.74 |
| | 2001-02 | 20 | 6.42 | 1.25 | 2,311 | 1,700 | 10.13 | 1.36 | 0.66 |
| #15 | 1977-78 | 50 | 1.15 | 2.15 | 5,698 | 1,023 | 12.45 | 1.00 | 1.00 |
| | 1981-82 | 20 | 1.16 | 1.54 | 1,242 | 1,323 | 5.37 | 2.32 | 1.53 |
| | 1986-87 | 20 | 1.20 | 1.54 | 1,309 | 1,700 | 7.32 | 1.70 | 0.98 |
| | 1991-92 | 20 | 1.70 | 1.53 | 1,583 | 1,700 | 8.29 | 1.52 | 0.84 |
| | 1996-97 | 20 | 3.53 | 1.58 | 2,276 | 1,700 | 10.04 | 1.31 | 0.82 |
| | 2001-02 | 20 | 6.42 | 1.59 | 3,000 | 1,700 | 11.87 | 1.16 | 0.72 |

Table 11 (Continued) Values of Key Teacher Education Institution Variables, 1977-78 through 2001-02

| | Simulation Number and Year | Percent of New Teachers | Teacher Retirement Rate (%) | Preservice Admissions Ratio | # of Admissions | | Student/ Faculty Ratio | Index of Cost per Student | Index of Cost per Graduate Hired |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Preservice | Inservice | | | |
| #16 | 1977-78 | 50% | 1.15% | 2.15 | 5,698 | 1,023 | 12.45 | 1.00 | 1.00 |
| | 1981-82 | 50 | 1.16 | 1.25 | 2,529 | 1,323 | 8.06 | 1.54 | 0.81 |
| | 1986-87 | 50 | 1.13 | 1.25 | 2,591 | 1,700 | 10.45 | 1.19 | 0.55 |
| | 1991-92 | 50 | 1.18 | 1.25 | 2,956 | 1,700 | 12.41 | 1.02 | 0.48 |
| | 1996-97 | 50 | 1.58 | 1.25 | 3,279 | 1,700 | 13.38 | 0.98 | 0.49 |
| | 2001-02 | 50 | 1.89 | 1.25 | 3,194 | 1,700 | 13.15 | 1.05 | 0.52 |
| #17 | 1977-78 | 50 | 1.15 | 2.15 | 5,698 | 1,023 | 12.45 | 1.00 | 1.00 |
| | 1981-82 | 50 | 1.16 | 1.54 | 3,106 | 1,323 | 9.26 | 1.34 | 0.86 |
| | 1986-87 | 50 | 1.13 | 1.54 | 3,195 | 1,700 | 11.92 | 1.04 | 0.59 |
| | 1991-92 | 50 | 1.18 | 1.53 | 3,607 | 1,700 | 14.15 | 0.89 | 0.52 |
| | 1996-97 | 50 | 1.58 | 1.58 | 4,133 | 1,700 | 15.68 | 0.84 | 0.52 |
| | 2001-02 | 50 | 1.89 | 1.59 | 4,075 | 1,700 | 15.52 | 0.89 | 0.56 |
| #18 | 1977-78 | 50 | 1.15 | 2.15 | 5,698 | 1,023 | 12.45 | 1.00 | 1.00 |
| | 1981-82 | 50 | 1.16 | 1.25 | 2,529 | 1,323 | 8.06 | 1.54 | 0.81 |
| | 1986-87 | 50 | 1.20 | 1.25 | 2,659 | 1,700 | 10.61 | 1.17 | 0.55 |
| | 1991-92 | 50 | 1.70 | 1.25 | 3,268 | 1,700 | 12.54 | 1.01 | 0.46 |
| | 1996-97 | 50 | 3.53 | 1.25 | 4,444 | 1,700 | 15.51 | 0.85 | 0.42 |
| | 2001-02 | 50 | 6.42 | 1.25 | 5,778 | 1,700 | 18.88 | 0.73 | 0.35 |
| #19 | 1977-78 | 50 | 1.15 | 2.15 | 5,698 | 1,023 | 12.45 | 1.00 | 1.00 |
| | 1981-82 | 50 | 1.16 | 1.54 | 3,106 | 1,323 | 9.26 | 1.34 | 0.86 |
| | 1986-87 | 50 | 1.20 | 1.54 | 3,271 | 1,700 | 12.10 | 1.03 | 0.59 |
| | 1991-92 | 50 | 1.70 | 1.53 | 3,957 | 1,700 | 14.28 | 0.88 | 0.49 |
| | 1996-97 | 50 | 3.53 | 1.58 | 5,689 | 1,700 | 18.66 | 0.70 | 0.44 |
| | 2001-02 | 50 | 6.42 | 1.59 | 7,500 | 1,700 | 23.23 | 0.59 | 0.37 |

Table 12 Recapitulation of Values of Key Teacher Education Variables, Simulation Numbers 16 and 17.

| Year | Simulation Number | New Teachers as % of Teachers Hired | Teacher Retirement Rate | Preservice Admissions Ratio | Number of Admissions | | | Student/ Faculty Ratio |
|---|---|---|---|---|---|---|---|---|
| | | | | | Preservice | Inservice | Total | |
| 1977-78 | 16 | 50% | 1.15 | 2.15 | 5,698 | 1,023 | 6,721 | 12.45 |
| | 17 | 50 | 1.15 | 2.15 | 5,698 | 1,023 | 6,721 | 12.45 |
| 1981-82 | 16 | 50 | 1.16 | 1.25 | 2,529 | 1,323 | 3,852 | 8.06 |
| | 17 | 50 | 1.16 | 1.54 | 3,106 | 1,323 | 4,429 | 9.26 |
| 1986-87 | 16 | 50 | 1.13 | 1.25 | 2,591 | 1,700 | 4,291 | 10.45 |
| | 17 | 50 | 1.13 | 1.54 | 3,195 | 1,700 | 4,895 | 11.92 |
| 1991-92 | 16 | 50 | 1.18 | 1.25 | 2,956 | 1,700 | 4,656 | 12.41 |
| | 17 | 50 | 1.18 | 1.53 | 3,607 | 1,700 | 5,307 | 14.15 |
| 1996-97 | 16 | 50 | 1.58 | 1.25 | 3,279 | 1,700 | 4,979 | 13.38 |
| | 17 | 50 | 1.58 | 1.58 | 4,133 | 1,700 | 5,833 | 15.68 |
| 2001-02 | 16 | 50 | 1.89 | 1.25 | 3,194 | 1,700 | 4,894 | 13.15 |
| | 17 | 50 | 1.89 | 1.59 | 4,075 | 1,700 | 5,775 | 15.52 |